Update on End-of-Service-Life Indicator Project
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A respirator cartridge simulator that accommodates the product of this research project, a low power, low cost sensor, has been constructed and successfully evaluated against NIOSH certification criteria.

Testing will be conducted over the next several months to put the sensors in the cartridge simulator and evaluate them to determine if they function as we expect them to operate in a carbon bed. Once we have demonstrated the concept, 80 sensors will be distributed to the manufacturers who volunteered through the Federal Register Notice published in August 2004. This notice resulted in eight prominent manufacturers volunteering to collaborate with NIOSH NPPTL to integrate sensor systems into respirators. It is anticipated that these systems will be distributed to manufacturers later this calendar year.

For those who may be unfamiliar with this project, the following background information is provided.

New Sensor Technology Development for End of Service Life Indicators Project

In 1998, the Occupational Safety and Health Administration (OSHA) set forth revised respiratory protection standards that changed the way chemical cartridges for respirators are selected and used. Under the new OSHA regulations, either an end-of-service-life indicator (ESLI) or a changeout schedule is required to determine when cartridges need to be replaced. Prior to the revision, odor detection was permitted and frequently used as the determination method for changing cartridges. However, due to variations in the ability of people to detect odors, gases and/or vapors, this method was found to be unreliable. In general, the availability of end-of-service-life indicators is very limited and there are no ESLI indicators for organic vapors. This project is designed to develop sensor systems that can detect multiple gases and vapors for application to personal protective equipment.

A report by the Bureau of Labor Statistics and NIOSH indicated approximately 250,000 establishments used respirators and 20% of those left respirator cartridge changeout up to the discretion of the employees. Under OSHA guidelines, this is unacceptable. OSHA requires the use of an end-of-service life indicator or a formal plan, such as the use of service life calculators, must be in place. Calculators require sophistication on the part of the user, which may not be practical.

This project will help users of air-purifying respirators by the development of sensor systems. Manufacturers will be able to use the data generated during this project to improve their products by incorporating the technology that measures cartridge breakthrough.

The research will facilitate producing low power, small, low cost sensors that can be integrated into air purifying respirator cartridges to prove end-of-service life information as well as residual service

life information. The sensors system should also have sufficient flexibility so that it can be incorporated into other personal protective devices.

Researchers working on this project successfully designed a sensor package. Based on problems identified during the evaluation phase, the device was redesigned to allow independent sensing of target organic vapors with up to three independent signals. In addition, changes were made in the electronic circuitry to reduce thermal and electrical drift and interferences in the sensor signals. This should provide more stable operation and more accurate sensor signaling of the target organic vapors.

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